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Diversity And Dominance Species Of Benthic Gastropod In Three Coastal Condition West Bali National Park

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ABSTRACT

The aim of this research was to determine the composition, domination, and diversity of benthic gastropod in three coastal condition of West Bali National Park, Province Bali. This research conducted with transect method. The research datas were raised at three location with different type of substrate, there are Prapat Agung Beach, Karang Sewu Beach, and Cekik Beach. The substrate type was rough sand, cobble, and smooth sand. Every location has two transect which is upright the contur, each transect consists of plot with the measure for every plot is 1 m^2. The interval for every transect is 100 m, while for every plot is 10 m. Ponar dredge was use to raised benthic gastropod. Identification of benthic gastropod was refer to identification key. The result of this research showed that 25 species from 14 family of gastropod founded at three coastal condition. Euplica scripta was dominated in the first location with index of domination is 57.14%, Terebralia palustris was dominated in the second location with index of domination is 93.46%, and Hastula hectica was dominated in the third location with index of domination is 100%. According to the result, we can conclude that composition, domination, and diversity of benthic gastropod are interrelated with substrate type of the coastal.

Introduction

The coastal areas are the area which has high abundance of resources. This areas were potentially to fulfill the necessary of life and stabilize the environment condition. The measurement of coastal areas in this world just ± 10%, but can be supplied until 80% productivity of the wealth sea in the world (Mann, 1982). West Bali National Park, as known as Taman Nasional Bali Barat in Indonesian, has the totally areas are 19.002,89 ha. This area consist of 15.587,89 ha terrestrials, and 3.415 ha waters (SK Menteri Kehutanan No. 493/Kpts-II/1995). The coastal areas of West Bali National Park was the strategic place, because it been one of the most supplier fish for national productivity. The fish lifes can be affected for many factors, one of the factor is the existence of benthic gastropods. Benthic gastropods as fish food source and bioindicator for the environment has an important role. Based on the lives place, benthic gastropods were classified into epifauna and infauna. Epifauna is

organisms that adhere on the seagrass and in the surface of base substrate, while infauna is organisms that can lives inside the substrate (Odum, 1971).

The aim of this research was to determine the composition, domination, and diversity of benthic gastropods in the coastal area of West Bali National Park. Sampling was located in three coastal areas with different condition. First location is Prapat Agung Beach. Prapat Agung Beach is a sandy beach with some vegetation grown at this location. Second location is Karang Sewu Beach. Karang Sewu Beach is a rocky beach with an ecosystem of mangroves there. And, third location is Cekik Beach. This beach was a beach with the smooth sand. Information of the abundance, composition, domination and diversity of benthic gastropod has an important value. So, it will be classify according to the condition of every coast.

This research hopefully can give more datas about biodiversity, used as guidance for the next research, and provide more datas about species of benthic gastropods in West Bali National Park.

Materials and Methods

The tools used in this research are Global Positioning System (GPS), roll meter, plot 1 m^2, gloves, Ponar dredge, plastic rope, plastic bags, shovel, pipette, book of marine ecology that is *Marine Biology: An Approach Ecological* (Nybakken, 1988), book of benthic identification *Compendium of Sea Shell* (Abbott & Dance, 2000), snorkel goggles, multilevel substrate filters, loops, tweezers, portable lights, life jackets, stationary equipment, laptop, and digital camera.

The research materials used were benthic gastropods at Prapat Agung Beach, Karang Sewu Beach, and Cekik Beach which were crossed by transect, 36% of formalin, and aquades.

Methods

Benthic gastropods samples in West Bali National Park were raised at three location with different substrate type consist of rough sand, cobble, and smooth sand. At each location, samples were raised on two transects perpendicular to the contour line of ± 30 meters and the interval for each transects is 100 meters. Each transect consists of 5 plot measuring 1 x 1 meter. Plot has placed in the line transect with zig-zag model. The aim for that placement is to obtain data objectively. Every plot is divided into 16 smaller subplots, but samples were raised use 5 subplots randomly. Figure form plot and layout plan of plots on each transect are presented in Figure 1.

Gastropod specimens are sampled in two ways, for the first way used hands directly. This way especially used for samples that creep on the surface of substrate. Second way used Ponar dredge. This way can be used for samples that buried in the substrate. Samples from each plot were divided according to the degree of morphological similarity. Each similar specimen was identified using an identification key, is *Compendium of Sea Shell* (Abbott & Dance, 2000). To determine the name and sum of the species, so the data was noted. Data from each plot on all transects were put together to obtain data for each location. Data from each location was analyzed to determine the composition, domination, and diversity species of benthic gastropod.

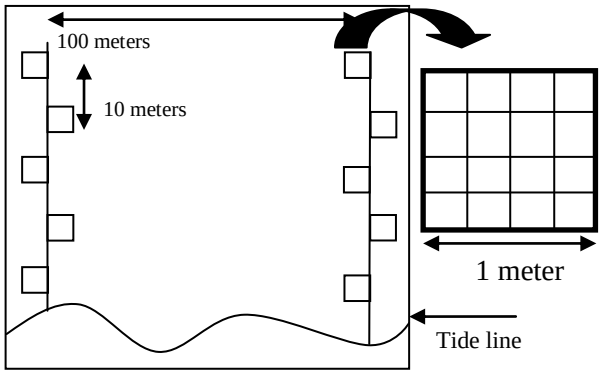

Figure 1. Form of plot and map for plots placement

Data Analysis

The data analysis used in this study is the dominance index and species diversity

index, with detailed explanations as follows.

A. Index of dominance

The status of dominance of each benthic gastropod species is determined based on the Odum's Dominance Index (1971) as shown in Formula 1.

$$D = \frac{ni}{N} \times 100\% \quad \text{..... (1)}$$

Where :
D : Dominance index
Ni : Sum of individuals for each species
N : Sum of individuals for all species
(Torgensen *et al.,* 2006).

The standard dominance index value in relation to the degree of mastery and quantity of species in the environment (Torgensen *et al.,* 2006).

Table 1. Dominance Benchmark
(Source: Torgersen *et. al.,* 2006. 473– 492)

Value of dominance index	Dominance Status
>50%	Dominant
10-50%	*Common*
<10%	Seldom

B. Diversity index

The Shannon-Wienner Diversity Index is calculated based on formula 2.

$$H' = -\sum\{(ni/N) \times \ln(ni/N)\} \quad \text{..... (2)}$$

Where :
H' = Shannon-Wienner diversity index
ni = Sum of individuals for each species
N = Sum of individuals for all species (Odum, 1993).

Measuring the level of species diversity and status are presented in environmental conditions based on the Shannon-Wienner Diversity Index presented in **Table 2**.

Table 2. Measure of Species Diversity Levels and Environmental Condition Status based on the Shannon-Wiener Diversity Index.

Value of Diversity Index	Level of Diversity and Status of Environmental Conditions
H' < 1,0	Low diversity, poor productivity, very low as an indication of heavy pressure and an unstable ecosystem.
1,0 < H' < 3,322	Medium diversity, sufficient productivity, fairly balanced ecosystem conditions, moderate ecological pressure.
H' > 3,322	High diversity, stable ecosystem stability, high productivity, resistance to ecological pressure.

(Source: Odum, 1993)

Results and Discussion

Results

The results showed that the general conditions in three coastal location was different. First, Prapat Agung Beach which has wide until 3 km is a landau beach. On the right hand side, the coastal conditions were overgrown by macro algae and seaweed associations. While on the left hand side, it was found mangrove colonies which grew scattered with a variety of wide and thickness. Second, Karang Sewu Beach is a bay which used as a dock. The basic condition of this coast was dominated by cobble substrate with thin sandy in the some areas. In the several part of this coastline was growed by mangrove, without macro algae or seaweed. Placement transects in this location was represented two different condition, is coastal with mangrove colonies and coastal without mangrove colonies. Third, Cekik Beach is a beach which has the uniform condition. The condition was drew just by sand without vegetation, macro algae, seaweed, and mangroves.

From the sampling results, we had raise 235 individuals of benthic gastropod. All of the sample consists of 25 species from 14 families. The enumeration results and conversion of area units (10 m^2) from each spesies were presented in Table 3.

Table 3. Data of Species, Abundance, Domination, and Diversity of Gastropods

Name of species	The abundance of each location						Total	
	Prapat Agung Beach		Karang Sewu Beach		Cekik Beach			
	Ni	D (%)	Ni	D (%)	Ni	D (%)	Ni	D (%)
Family Cerithiidae								
1. *Cerithium sp.*	4	1.702128	0	0	0	0	4	1.702128
2. *Cerithium atratum*	4	1.702128	0	0	0	0	4	1.702128
3. Cerithium coralium	7	2.978723	0	0	0	0	7	2.978723
4. Cerithium rostram	4	1.702128	0	0	0	0	4	1.702128
5. C*lypeomorus sp.*	0	0	4	1.702128	0	0	4	1.702128
6. *Rhinoclavis vertagus*	0	0	4	1.702128	0	0	4	1.702128
Family Planaxidae								
7. *Planaxis sp.*	4	1.702128	0	0	0	0	4	1.702128
Family Potamididae								
8. *Cerithidea cingulata*	7	2.978723	0	0	0	0	7	2.978723
9. *Terebralia palustris*	0	0	596	253.617	0	0	596	253.617
Family Neritidae								
10. *Nerita articulata*	0	0	4	1.702128	0	0	4	1.702128
Family Cassidae								
11. *Semicassis bisulcata*	4	1.702128	0	0	0	0	4	1.702128
Family Cypraeidae								
12. *Talostolida teres*	0	0	4	1.702128	0	0	4	1.702128
13. *Monetaria moneta*	4	1.702128	0	0	0	0	4	1.702128
Family Columbellidae								
14. *Euplica ionida*	4	1.702128	0	0	0	0	4	1.702128
15. *Euplica scripta*	64	27.23404	7	2.978723	0	0	71	30.21277
16. *Euplica sp.*	4	1.702128	0	0	0	0	4	1.702128
Family Costellariidae								
17. *Vexillum sp.*	0	0	7	2.978723	0	0	7	2.978723
18. *Vexillum virgo*	0	0	4	1.702128	0	0	4	1.702128
Family Mitridae								
19. *Mitra nubile*	4	1.702128	0	0	0	0	4	1.702128
Family Nassariidae								
20. *Nassarius globusus*	0	0	4	1.702128	0	0	4	1.702128
Family Pisaniidae								
21. *Engina alveolata*	4	1.702128	0	0	0	0	4	1.702128
22. *Engina sp.*	0	0	7	2.978723	0	0	7	2.978723
Family Terebridae								
23. *Hastula hectica*	0	0	0	0	4	1.702128	4	1.702128
Family								

Pseudomelatomidae								
24. *Brachytoma sp.*	4	1.702128	0	0	0	0	4	1.702128
Family Chilodontaidae								
25. *Euchelus atratus*	0	0	4	1.702128	0	0	4	1.702128
Sum of Taxonomy	14		11		1			
Sum of Abundance	235							
Domination		51.91489		274.4681		1.702128		
H'	1.326218		0.753101		0.069333			

Discussion

Based on the results (Table 3) it is known that the sum of the benthic gastropod individuals in three location are 235 individuals. Prapat Agung Beach has a diversity index of 1.32628 which classified to moderate diversity, balanced productivity and moderate of ecological pressure. The dominant species in this location was *Euplica scripta*, which has dominance index 57.14%. Then, at Karang Sewu Beach has a diversity index of 0.753101 which classified to low diversity and poor productivity, indicating that the ecosystem was not stable due to the high pressure. *Terebralia palustris* has been dominant species in this location, which has an index of domination 93.46%. This is happened because *Terebralia palustris* is a species that actually lives on sandy substrates (Rambabu et. al., 1987). In the third location, Cekik Beach, has a diversity index of 0.069333 which classified to low diversity and very low productivity which can indicated very high pressure and unstable of ecosystem. The dominant species in this location was *Hactula hectica*. This species has dominance index 100%. The community structure for each location was varied, both in sum of taxonomy, sum of abundance, and domination structure. At each location was not found the same species, except *Euplica scripta.* This is happened because in every location has not same substrate composition and beach characteristics. Firs location, Prapat Agung Beach, has a rough sand substrate. Second location, Karang Sewu Beach, has a cobble substrate. Third location, Cekik Beach, has a smooth sand substrate.

Second and third location have low diversity index, due to the basic substrate can not support the lives of some species of benthic gastropods. Then, the sandy substrate can not be the adhere place for some organism, especially for benthic gastropods. The adhere place was useful for the benthic gastropods, especially to survive from wave of the sea. The lack of vegetation in Cekik Beach also gave some effect to the abundance of benthic gastropods. This is caused gastropods, as a detritus consumer, need some vegetation with sufficient amount in their habitat.

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